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THE EAST-WEST POPULATION INSTITUTE, directed by Dr. Paul Demeny, carries out multidisciplinary research and training as well as related service activities in the field of population, with an emphasis on economic, social and environmental aspects of population problems in the Asian/Pacific area.

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POPULATION STATISTICS OF AMERICAN SAMOA:
A REPORT TO THE GOVERNMENT OF AMERICAN SAMOA

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Introduction

The Government of American Samoa (GAS) requires reliable demographic information for comprehensive development planning and program evaluation. Although the territory has fewer than 30,000 inhabitants and is accessible only by air and sea, estimating its population has been a difficult task principally owing to the large, yet irregular, migration of Samoans. A body of government-sponsored statistics on population exists, but unfortunately many of the data lack internal consistency.

The author was requested to examine in a consultant capacity the available demographic statistics for the territory and to render the following services:

(a) Assessing the reliability of the available demographic data,
(b) Recommending improvements in the collection and compilation of demographic data,
(c) Developing methods for estimating the population, and
(d) Projecting future population trends up to the year 1990.

To fulfill these assignments the author visited Pago Pago during January 15-23, 1972. On that occasion he made contacts with such governmental agencies engaged in producing and utilizing demographic statistics as Development Planning, Immigration Services, Medical Services, High Court, and Office of Samoan Affairs; and he collected a variety of population-oriented data. Upon his return from Pago Pago he obtained supplementary information. Most of the analytical work was done after mid-April, however, when the 1970 Population Census reports were made available by the U.S. Bureau of the Census.

In preparing the report, no attempt was made to adjust the data from censuses of the territory, although some questions were raised regarding the accuracy of age statements and the criteria for "usual place of residence" (McArthur, 1968). Because of the large volume of migration, both in and out, it is impossible to use conventional statistical methods to ascertain the accuracy of age reporting and completeness of the census. Nevertheless, even for the 1920 census the reported ages of the population under 20 years are believed to be fairly accurate and the ages of older people are probably sufficiently accurate for a classification by broad age groups (Hill, 1992). For practical purposes the data of recent censuses will be considered as adequate to use without statistical adjustment.

Summary and Recommendations

During the past half century the population of the territory of American Samoa more than tripled, but much of the natural increase was removed by emigration. IN the decade 1950-1960 probably more than 30 percent of the total population of the territory left the islands.

Heavy emigration is seen among person in the ages of 15 to 30 years, but among middle-aged persons immigrants tend to out-number emigrants. Population movement into or out of the territory is much more pronounced for males than for females.

If current fertility were to prevail during the next 20 years and there were no migration, the population would double in that period, exceeding 56,00 by 1990, and increase about three times in a generation. The crude birth rate would increase to more than 43 per 1,000 after 1980. Even if fertility declines somewhat in the near future,

natural increase will maintain a level of 3.5 percent per annum. If fertility begins to decline by 5 percent every five years from 1975, for example, the population will still grow to 52,500 by 1990 in the absence of migration. The difference in population size under an assumption of constant fertility from that resulting from a decline in fertility would increase at an accelerating rate beginning in 1990, when the birth cohort of 1975 enters the childbearing age groups.

If the level of emigration observed in 1950-70 continues, the population will only slightly surpass 40,000 in 1990 under the assumption of constant fertility, and 37,000 under the assumption of declining fertility. Out-migration would relieve the population pressure considerably, but it would also increase the burden of dependency, for the proportion of children under 15 years of age and of adults over 65 years would increase.

In the Government several agencies are involved with the collection and use demographic statistics. Many of their statistical activities are interrelated. Duplications of effort and large discrepancies in the statistics used by these agencies are frequently observed. A coordinating body on statistical activities should therefore be created for a constant review of the statistical system.

The completeness of vital statistics appears to be satisfactory. However, a single system for birth and death registration should be established instead of the current dual system maintained by the Medical Services Department and the High Court. Improvement of registration forms and the compilation process should be sought.

Migration statistics are of low quality, especially those on departures. An overhaul of the entire system is necessary. A clear definition of terminology and criteria of classification should be established. An expansion of statistical presentation should be studied to include age and sex of migrants.

Birth statistics, resident registry, and other statistical activities maintained by the Office of Samoan Affairs should be carefully examined as to their necessity, reliability, and utility.

Development of a more adequate system to protect and maintain demographic data is urgently required. Methods of storage, retrieval, and safety from destruction should be strengthened.

Until a more reliable bookkeeping of migration is made available, a suitable method of estimating population should be developed that uses symptomatic variables, which are sensitive to population change and are readily retrievable. For the present, birth, death, and elementary school enrollment data appear to be useful for estimating population. As to the technique, a modification of the Bogue-Duncan Composite Method is recommended for estimating population by broad age groups.

Statistics on dwelling units, electric utility, income tax, and auto registration do not appear to be adequate for estimating population. This is partly due to the relative newness of such statistical series. For possible future use, correlations of these data with population change should be investigated.

Use of health statistics should be studied. The registration data in the filariasis program are especially likely to provide a powerful tool for estimating the current population by small areas.

Overview of the Demographic Situation

A brief review of the current population situation is presented in this section in the hope of providing background information for the discussions to follow. The previous study by McArthur (1968), which is detailed and comprehensive, and the work by Pirie (1970) are valuable, but they need to be complemented with more recent data including 1970 census reports.

Growth and Migration

During the past half century, the population of American Samoa increased about three and a half times. It increased from 8,000 in 1920, when the first decennial census of the territory was taken as part of the U.S. Census, to 27,000 in 1970. The pattern of increase has varied with time, however. Between 1920 and 1940 decennial growth was about 25 percent. A phenomenal increase was observed during the 1940s, but during the next decade the population gained less than 6 percent. Then over the past decade a tremendous rise in the rate of increase was again recorded as shown in Table 1.

Table 1. Census Population of American Samoa: 1920-70

Year	Population	% Increase
1920	8,056	
1930	10,055	24.7
1940	12,908	28.4
1950	18,937	46.7
1960	20,051	5.9
1970	27,159	35.5

Though McArthur (1968) contests the method of enumeration for visitors, especially in the earlier censuses, the enumerated population should be regarded, by and large, to reflect the actual population size at the time of census taking.

Migration has played an important role in the population growth. Prior to 1950, population growth was much influenced by the net migration from Western Samoa to American Samoa. However, from 1950 the migration of American Samoans to Hawaii and California became an additional factor to consider. Unfortunately, precise quantitative assessment of the movement is difficult to gauge from the available data. (See, for instance, Bowman, 1972).

Although there must have been a large volume of population exchange between the two Samoas during 1920-1940, the net population gain from migration may have been negligible. The growth rate of the two decades does not appreciably differ from the natural increase. Bits and pieces of information indicate that the crude death rates fro 1920-30 ranged from 20 to 15 per 1,000, and for 1930-40, from 15 to 10. (For instance, Pirie, 1970, says that average crude death rates were 35 between 1906 and 1917, and 13 in 1927.) The crude birth rates must have always been 40 or over. The natural increase rate, therefore, should have been slightly over 20 per 1,000 during 1920-30 and 25 during 1930-40. An annual increase rate of 2 percent would result in a 22 percent growth in

population in a decade, and an annual increase rate of 2.5 percent would in turn result in 28 percent population growth; these decennial rates roughly coincide with the observed intercensal growth.

The decrease of mortality in the 1940s should have been somewhat slackened compared with before, as the rate had already reached a rather low level. (The 1961 UN Demographic Yearbook cites the rate as 9.1 for 1945-49 and 7.4 for 1955-59.) The spectacular rise in the rate of increase in the decade 1940-50 was caused by an increased flow from Western Samoa. McArthur (1968) estimates that one-fifth of the total increase of 6,000 were in-migrants.

The Samoan population in Hawaii was meager prior to 1950. With the transfer of administration of the territory from the Navy to the Department of Interior, a wave of migrants began to arrive in Honolulu in 1951 (Born, 1968). In July 1952, the U.S.S. President Jackson alone brought as many as 1,000 Samoans (Eyde, 1954). Apparently, the influx of Samoans to Hawaii continued through the decade and into the 1960s. A survey conducted in 1964 of a Samoan community in Hawaii consisting of 400 persons indicates that almost 80 percent of them arrived during 1959-63 (Yost, 1965). This situation is well supported by the extraordinary low growth rate of 1950-60 in the territory. From the recorded births and deaths, it is known that there was an intercensal natural increase of 6,490. Since there were only 1,114 gains between the two censuses, the difference, which is nearly 5,400, is attributed to net out-migration in the 1950s. (According to the census reports, however, there was a net decrease of 200 even among the Western Samoans born during this decade, making the net out-migration of American Samoans of the order of 5,200—which is nearly 30 percent of the 1950 total population.)

Table 2. Migration and Natural Increase, American Samoa: 1960-70

Item		Male	Female	Total
(1)	1960 Census Pop	10,164	9,887	20,051
(2)	Intercensal births	4,997	4,702	9,699
(3)	Intercensal deaths	773	528	1,301
(4)	Imputed 1970 Population (1+2-3)	14,388	14,061	28,449
(5)	1970 Census Population	13,682	13,477	27,159
(6)	Net Migration (4-5)	706	584	1,29027,159
(7)	Actual Increase (5-1)	3,518	3,590	1,2907,108
(8)	Natural increase (2-3)	4,224	4,174	7,108
(9)	Percent decennial Increase (7/1)	34.6	36.3	8,398
(10)	Percent decennial Natural increase (8/1)	41.6	42.2	35.4
(11)	Percent decennial Migration (6/1)	6.9	5.9	6.4
(12)	Annual increase rate	3.02	3.15	3.08

As Table 2 shows, although during the past decade the population gained more than 35 percent as a whole, there was a net out-migration of about 1,300, which

corresponds to 6.5 percent of the 1960 census population. In the meantime, however, a large number of in-migrants came from Western Samoa. The 1960 census reports 1,704 persons born in Western Samoa, whereas the 1970 reports 4,535, a net gain of 2,831. There were also 955 more persons reported to have been born in other foreign countries (presumably most of them from Tonga), thus making a total gain of 3,786 foreign-born. Adding the net out-migration of 1,290 to this increased number of foreign-born, an outflow of 5,076 American Samoans is imputed. But this is not all. There was also an increase of 990 persons residing in American Samoa who were born in the United States. Some of them are Samoans born in Hawaii or California. There is no way to assess the number of returning Samoans. If it is wildly conjectured that one-half of these 990 U.S.-born were indeed Samoans, nearly 5,600 American Samoans are considered to have left the territory. If the territorial population with American Samoan Ethnicity was 18,000 in 1960, this means that over 30 percent of them have moved out of the islands during the past 10 years, probably mainly to Hawaii.

The report of the 1970 census also presents the residence status in 1965. There were 1,126 American Samoans living in the United States and 2,806 in foreign countries five years before 1970. It cannot be determine dhow many of those who lived in the United States were Samoan returnees. To judge from the number, however, a substantial proportion should be Samoans. Since nearly 80 percent of the foreign-born originated from Western Samoa, over 2,000 Western Samoans may be regarded as having migrated during the five years preceding the census. In fact, among all the foreign-born, 22 percent migrated during a 15-month period in 1969-70, and an additional 20 percent did so in 1967-68. In all, 51 percent of the foreign-born have migrated since 1965, and 74 percent since 1960 (1970 Census Population, American Samoa).

Information regarding Samoans in Hawaii is practically nonexistent. Since they are U.S. nationals, no immigration records are kept nor are they identified in any part of the census reports (Bowman, 1972). The Hawaii Health Surveillance Program, surveying Oahu households over a 36-month period ending March 31, 1967, estimated that there were 2,420 Samoans. The Samoan Task Force on Immigration in December 1971 "identified" 6,544 Samoans in a survey on which the Task Force itself does not place much reliability. The State statistician obtained a figure of 5,660 from births reported (Bowman, 1972). The State Health Department releases the vital statistics data by race, and since 1963 the Samoans have been established as a separate category. Prior to this time they were included in the Category "other races." The number of Samoans births, which is the only vital even with appreciable size, has been remarkably uniform, ranging from 280 to 300 annually, except for the two years 1968-69 when the number decreased by half or more (see Table A1*). A substantial number of Samoans may have returned home in these years. There were fewer than 200 annual births of "other races' in 1950-54, but from 1955 the births in this category started to increased rapidly, reaching 517 in 1961. Most of these increased births may be those of Samoans. If so, a large influx of Samoans to Hawaii is indicated for the Latter half of the 1950s.

The rate of natural increase for the territory will continue to be very high at least for the time being, probably at an order of 3.5-3.8 percent per annum. This means that less than 20 years is required to double the population. An extensive population outflow will undoubtedly modify the actual increase, as has been seen in the past; but with economic development and a rising living standard in the territory it is more likely that

the population increase will be accelerated, since fewer American Samoans will leave and more Western Samoans will arrive.

Age and Sex Distribution

Migration, compounded by its size, direction, and selectivity, has caused distortions in the age and sex distribution. (Lack of reliable migration data also constrains the utility of conventional analytical techniques for evaluating the accuracy or age heaping of census data.) As is evident from the age pyramids of the last two censuses shown in Figure 1, the population is typically young; children under 15 years of age comprise practically half of the total population. (In the United States the comparable age group comprised 31 percent of the population in 1960, when the post-war "baby boom" had produced the largest proportion of children under 15 in several decades. The proportion in 1970 was 28.4 percent. By 1980 it will become probably less than 25 percent.)

Consequently, the median age in American Samoa has been 16 or so as shown in Table A2. In 1960 the median age of males was not even quite 15 years. (The median age of males in Hawaii, which is one of the youngest states in the union, was 24.7 in 1960. The median age of the U.S. total population in 1970 was 28.1.) This high proportion of children and the young median age in the territory result from high fertility and a loss of person in the productive ages through migration.

A large dip at ages 20-30 in the population pyramids depicts the age selectivity of out-migration. This deficit in the young is especially noticeable among males in 1960; females outnumber males in the age groups 20-40. Among youths in 1970, however, the male population was smaller than that of the female only in age group 20-24. Low sex ratios were observed in age groups 35-44, which were the cohorts with a sex ratio of less than 80 in 1960, and among children aged 10-14.

The discrepancy between the expected male survivors in 1960, obtained by applying estimated survival ratios to each age group of 1950, and the actual, enumerated male population 1960 provides an estimate of net migration by age (residual method). With this technique, the net out-migration rate of the 15-19 age group in 1950 is estimated to have been as much as 55 percent during the ten-year period of 1950-60. The out-migration rate of the 10-14 age group becomes 44 percent, followed by groups aged 20-24 and 25-29 at a present 30 percent level (see table A3). These rates do not differ much from those of the Wolf Report (1969)., which shows consistently higher figures than the present report. Age-specific migration of females did not necessarily comply with the pattern for males. Although the highest rate was observed in the age group 25-29 in 1950 (33 percent), the emigration rate did not vary much from age to age, ranging only from 25 to 30 percent.

Between 1960 and 1970 an entirely different picture of age-specific net migration is observed. There are several age cohorts in which the 1970 population has even exceeded the population of 1960. These are, among males in 1960, age groups 20-24, 25-29, 30-34, and 40-44 years, and, among females, 0-4 years. In addition, the number of males aged 45-49 years and of females aged 20-24, 30-34, and 40-44 years in 1960 decreased only slightly by 1970. These male age groups combined represent an in-migration rate of over 10 percent, according to the residual method.

(The in-migration rate of the age cohort 25-29 in 1960 is as much as 32 percent.) The only charts with substantial out-migration are those aged 10-20 years, which show rates of 25-35 percent among males and 17 percent among females (Table A3).

The proportion of old persons is relatively small. The population over 65 years of age has been about 2.5 percent. (The U.S. figure was about 10 percent in 1970.) The dependency ratio is just about 100 percent, meaning that every person of productive age has one additional mouth to feed.

Mortality and Fertility

Because of the size of the population, the age- and sex- specific death rates present some erratic fluctuations (see Table A4). Although the general shape of the mortality curve by and large conforms to experiences in other countries, it appears that the rise in mortality, after reaching a nadir in childhood, begins somewhat earlier than usual. The experience of most countries is that the age group 10-14 has the lowest mortality of the entire life span. In the territory, however, the age group 5-9 appears to have the lowest death rate. This situation may result from the small size of the sample. But it should be noted that in the Coale-Demeny Model Life Tables, the mortality "level" of young adults and the middle-aged is relatively low compared with that of childhood, which suggest an increased risk of mortality in early adult life. (The mortality "level" of the model life table increases as the magnitude of mortality decreases.) In general, the mortality "level" of the model life table is relatively high in early child-hood, decreases somewhat in the young adult and middle ages, then increases again in old age. During the ten-year period 1960-70, the general "level" appeared to improve except for the oldest age group. That exception may be due to an improvement in death reporting, as discussed later.

Generally, mortality is very low and is still being lowered slowly. Each of the age-specific rates is only slightly higher than the comparable rate for the United States. Due to the predominantly young population, however, the crude death rate of the territory is nearly half that of the nation. The age-adjusted death rate based on the 1970 U.S. population, which eliminates the influence of the age structure on the crude death rate, is 11.0 per 1,000 for 1969-71. The rate for the nation in 1970 was 9.4.

Although it may be too soon to assert the existence of a downward trend in fertility, there is some sign of a reduction in the birth rate in recent years. The crude birth rate declined from an annual average of 42.7 per 1,000 in 1959-61 to 38.4 in 1969-71. On the other hand, the general fertility rate (number of births per 1,000 women of childbearing age) remained practically at the same level, from 199 to 192. (In the nation the crude birth rate has been below 20 and general fertility rate below 100 since 1965.)

According to the preliminary data, some decline of fertility took place in the past decade only in the age groups 25-29 and 30-34, which have experienced the highest birth rates (see Table A5). In other age groups the changes are negligible. The total fertility rate (number of births a woman would have during her childbearing years under the

assumption of prevailing age-specific fertility) is 5.9. In the United States this rate has not approached 4 in the past 50 years; currently it is about 2.4. At the total fertility rate of 5.9, the territorial population will increase 2.9 times within a generation. The difference in the pattern of age-specific birth rates between the territory and the nation is shown in Figure 2 **(Click here to see Figure 2)**. Fertility below age 20 is somewhat lower for the territory, but after that age the territory presents rates 2-3 times higher than those of the nation.

The census data also indicate signs of fertility reduction. As seen from Figure 1, **(*Click here to see Figure 1.)** the population of 0-4 years in 1970 is only slightly larger than that of the age group 5-9. The ratio of children under fiver years of age to 1,000 women of childbearing age (child-woman ratio) declined from 936 in 1960 to 864 in 1970. The average number of children born per woman also decreased among women 15-34, as shown in Table 3, although a slight increase is seen for women 35-44.

Table 3. Average Number of Children born Per Ever-Married Woman, by Age Group, American Samoa: 1960 and 1970

Age Group	1960	1970
15-24	1.79	1.57
25-34	4.49	3.68
35-44	5.73	5.97

The 1960 census data show a large proportion of women with high parity. Over 29 percent of ever-married women in the territory had seven or more children, but in the nation the corresponding proportion was only 5 percent for white and 12.1 percent for nonwhite ever-married women.

Family planning services have been available to the population of the territory for some time. The Department of Medical Services indicates that no more than 4-7 percent of the population at risk have accepted the program (Dept. of Med. Services, CHP 314[d], 1971). Although fertility does show some sign of decline, probably a substantial reduction may not be observed is provided and the population accepts it.

Government Population Statistics

This section describes the current GAS activities in the field of population statistics, attempts to assess the quality and utility of the statistics with some analysys of data, and suggest measures for improving the demographic statistics system in the territory. Three major areas of activity are the efforts on head-counts, vital registration, and migration. The local agencies concerned with these activities are the Office of Samoan Affairs, the Vital Statistics Registrar of High Court, the Department of Medical Services, the Immigration Division of the Office of the Attorney General, and the Office of Tourism. In general, these agencies collect, process, and publish related data independently, with minimal coordination. The quality of data does not seem to be very high, with the exception of vital statistics.

Local Census and Resident Registration (Office of Samoan Affairs)

In addition to the decennial U.S. census, between 1962 and 1970 a series of annual "censuses" was taken by the Office of Samoan Affairs. According to officials at the Office, in the month of December, each of the 56 village chiefs (plenuu) was given a form for enumerating all the inhabitants of his village. Items included in the form were: name, sex, date of birth, birth place, social security number, father's name, mother's name, occupation, relation to the head of family, nationality, and marital status.

It is reported that the census was taken on a de jure basis. A person living at the same address for 30 days or more was to be regarded as a resident. In actuality, however, it is questionable to what degree this criterion was observed. For instance, in the 1968 "census" more than 2,600 Oriental nationals were enumerated; presumably the vast majority of them if not all, were tuna fishermen who customarily remained on the island for only a few days during the unloading and maintenance of their boats.

Although the Office of Samoan Affairs states that the "census" was taken annually, there are no published results except for 1968. Under the title of Population Report of American Samoa for 1968 (dated December 31, 1968), a 13-page mimeographed issue includes the topics: Population of American Samoa 1900-1968, Population by Counties and Villages 1950-1968, Population of Districts and Counties by Sex, Population by National Status, Matai Population by Districts and Counties, Population by Church Affiliation, and Birth Report by Districts and Counties in 1968.

On the last page it is stated:

> We shall include in future population reports the population of American Samoa by age and sex; married population by sex and age groups; and population by occupation and place of occupation. Also, there will be some comments and detailed analysis of our population.

To date there have been no such reports.

For 1967, the author managed to obtain data on age and sex distribution from an old file at the office. The there were two, conflicting series of age-sex distributions.* The official in charge thought that the annual "census" results had been published in the Governor's Annual Report. In the Annual Report series, however, merely the statement "based on unofficial census report approximating…" appears fro computer birth and death rates. These 'Unofficial census reports" are as follows:**

1963	21,000
1964	22,000
1965	23,000
1966	24,500
1967	28,000
1968	32,097
1969	33,000

After spending some time in the storage room that supposedly contained the original "census returns" and possibly some tabulations based on them, the author has concluded that tremendous effort would be required to put the files in order so that the needed information could be retrieved.

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*Out of one of the series of this "census," Pirie (1970) has quoted figures for the total population size, children under five years, and women of 15-44 years of age. He says that these were provided by the Medical Service Department. Otherwise, the 1967 "census" figures do not appear to have been released in any manner.

**Sources: for 1963-67, Annual Report of the Governor (1968); for 1968, Population Report of American Samoa for 1968; for 1969, Annual Report of the Governor (1970).

In 1970 the Office considered a local census unnecessary because the U.S. census was being taken that year. Instead, the plenuus were asked to report all the births that had occurred in their own villages since 1965, using the usual form of their census. Subsequently, the Office released "Population of the Peoples Borned in the Year 1965 to 1970" [sic] in mimeographed from. It lists the number of births by village, year, and sex of child. The numbers collected from plenuus were consistently smaller than the birth registration figures, especially for 1970 (see Table A6). (The number of births obtained in the 1968 census was only 164, compared with over 1,000 registered in the medical record department of the LBJ Tropical Medical Center.)

The Office does not take annual censuses anymore. Instead it has established a kind of resident registration called a "census card". According to the 1968 Annual Report of the Governor, "the office is developing a census card system and eventually will have card records for each citizen of the territory." No mention of this system is found in the 1969 Report. Figure A1 presents the form of the card. Although the 1968 Report indicates that 13,777 individual records (representing about one-half of the total population) were completed, the registration was still under way in January 1972. The stated purposes of the registration are (a) to substitute for the birth certificate as proof of U.S. nationality, (b) to serve for voter registration, and (c) to serve for estimating the current population size and its composition.

Vital Statistics

The Code of American Samoa prescribes that every birth and death must first be reported to the plenuu of the village in which it has taken place, and the plenuu in turn must report it to the health authority within ten days. The health authority is then required to forward the birth and death certificates to the Clerk of the High court (Territorial Registrar). In actuality, it is the practice of the health authority to accept notices of births and deaths, even when they are several months old, for registration as current vital events. On the other hand, events directly registered at the High Court are regarded as delayed registration regardless of the length of time elapsed since the event occurred. The Code also states "no burial of the body shall take place until permit for same has been issued by the County Chief of the County in which said burial is to be made." Nevertheless, practically all burials are performed without official permits. The

process of registration, currently practiced, is shown schematically in Figure 3. **(Click here to see Figure 3.)**

Until very recently, only the Medical Record Department compiled, tabulated, and published birth and death statistics. Now the Territorial Registrar, who has been responsible for the custody of records and issuing copies, also provides statistics; the first report by the Registrar was released in April 1972. Unfortunately, there are some discrepancies between the two agencies' figures even if the delayed reports are taken out.

Although birth, fetal death, and death statistics used to appear in the Governor's Annual Report, such data have not appeared since 1968. These published data are said to be prepared by the Department of Medical Services, and the tabulation plan was rather satisfactory for the recent years. As stated in the report, in 1972 the Registrar released the First Vital Statistical Report covering all vital events (i.e., births, deaths, fetal deaths, marriages, divorces, and adoptions). The reference period of the Report is for 1970 and 1971 but it includes some historical figures on births and deaths. The tabulation is primarily by simple, one-way classification.

The U.S. Bureau of the Census takes the position that "the relative completeness of the registration of births and deaths is not known" (Current Population Reports, P-25, No.423, May 28, 1969). On the other hand, the United Nations' 1959 Demographic Yearbook notes that the registration of births in the territory is estimated to be 99.8 percent complete. McArthur (1968) estimates that "about 12 percent of births were not registered before 1940, ten years later about 7 percent had not been registered, and probably less than 5 percent escaped registration between 1951 and 1956." The Registrar believes that birth registration may be at least 95 percent complete and death registration should be 100 percent complete. It should be emphasized that this is a subjective judgment.

The Registrar encounters delayed reports of birth from time to time. During recently years there have been 20 or fewer delayed registrations annually, according to the First Vital Statistical Report 1970-1971, though it is not clear whether the year shown in the Report represents the year of registration or the year in which the birth took place. (Most likely the former is the case.) In any event, these delayed reports are an indication of incompleteness of birth registration. (On the other hand, they may not simply mean that the births escaped registration at the time of occurrence. There is a possibility that some of them may have actually occurred in Western Samoa.)

Because of the necessity of presenting proof of identity in order to enroll in school or to travel, a need for birth registration eventually arises, even if considerable time has elapsed since the birth occurred. In case of death, however, no compelling need for registration seems to arise in this commune society once the death has escaped registration at the time of its occurrence. In fact, the Registrar says that he has never encountered delayed registration of death, and therefore no evidence exists of under registration of deaths.

The enumerated population under one year of age in 1960 was 871. On the assumption that the survival ratio from birth to under one year is .95547 (Coale-Demeny Model Life Table, "West Level 19," with the proportion of male births. 5152), this means there were 912 births during the one-year period preceding April 1, 1960. According to the vital statistics reports of 1959 and 1960, however, the estimate of births during the period is 863, implying 95 percent completeness of birth registration. Although any error

in the in estimation of mortality level would result in a different conclusion, there would not be a drastic difference as long as the mortality level estimated was not too unrealistic. But even moderate emigration would ensure an overestimation of completeness. A similar procedure for 1970 data (assuming a survival ratio of .96944, "West, Level 21"), indicates 99 percent registration. It is considered that the birth registration has improved over the years and by now only a few cases, if any, escape prompt registration.

The general experience is that death registration is better than birth registration. If this is also true in American Samoa, death registration may be considered to be practically 100 percent complete, as the Registrar of Vital Statistics asserts.

Early childhood mortality appears to be very low, and it probably is so. In view of the large proportion of births attended by the medical profession (95 percent in 1971), it seems that all early infant deaths are registered and not classified as fetal deaths. But in the case of old-age mortality there may be some under-registration because (a) the death rates are too low (the "level" of the model life table frequently surpasses 24) and (b) they have generally increased over time. Therefore, assuming that (a) the observed death rates from childhood to middle age represent the actual situation and (b) the downward mortality "level" continues to old age, we derived a series of ten-year survival ratios for 1960-70 as show in column 6 of Table A7. Applying these survival ratios to the census population of 1960, we obtained expected survivors in 1970 (Column 7). Further recorded deaths during 1960-70 were attributed to cohorts initially in the given age group of the 1960 census. Subtracting these attributed deaths from the original cohorts, we obtained another series of expected survivors in 1970 (column 4). The striking agreement between these two series of expected survivors, except for the old, suggests the validity of the determined mortality "level"

Migration

Statistics related to migration are compiled by two agencies, the Immigration Division and the Office of Tourism. The basic source of information is the Entry Clearance Form (GAS Form 452, Figure A2), which is distributed to all persons entering the territory. This form is jointly utilized by Immigration, Agricultural Quarantine, Customs, and Tourism agencies. (The form is said to be kept for five years by the Immigration Division.) The form collected by the Immigration Officer is checked with the Airline or shipping company manifest. A daily report is prepared showing the name, nationality, address, age, sex, length of stay, and a few other items pertaining to the individual migrant. A monthly statistical report based on the daily reports is submitted to the Attorney General. The report treats immigrants and emigrants (arrivals and departures) separately.* A two-way table is prepared for each of them, noting the means of travel (sea or air), nationality (Western Samoan, Tongan, or resident), and purpose (business, transient, or tourist).

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*Conventionally, the terms immigration and emigration refer to movements between countries, whereas the terms in-migration and out-migration refer to movements within national boundaries. Because American Samoa is a territory of the United States but has historical and cultural ties with Western Samoa, the distinction between the two types of migration is less meaningful than usual. For the purposes of this report, "in-migration"

and "out-migration" are used whenever movements between either American Samoa or the United States or between American Samoa and Western Samoa are clearly meant; if migration appears to be more general, "immigration" and "emigration" are used.

Before 1972 all outgoing passengers were required to complete the short version of GAS Form 452 (Figure A3), which provided the basic material for the departure statistics. In 1972 a new system was introduced that discriminates between the residents (American Samoans) and nonresidents. Entering the territory, all nonresidents are now given GAS FORM 452A (Figure A4), which is to be surrendered at the time of departure. For the collection of departing residents' data, the Immigration Division relies on the manifest listing the name, sex, ticket number, and baggage weight of the passenger. The annual report of the Immigration Division, which used to appear in the Governor's Annual Report, showed total arrivals and departures of Western Samoans and others for each quarter of the fiscal year. In addition, monthly total arrivals and departures were shown by mode of travel (air or sea). Regrettably, this information has not appeared in the Governor's Report since 1969.

The Office of Tourism each year presents monthly tables of arriving air passengers classified by (a) purposes (tourist, business, or transit) and sex, (b) nationality, (c) permanent address, and (d) place of origin and destination; a separate table gives the number of cruise passengers and excursionists. Evidently, these tables are prepared from the forms of those passengers who checked "tourist," "business," or "other" for "reason for visit" in FORM 452, since very few Western Samoans and Tongans and no American Samoans appear.

The Bureau of the Census states that "the migration component appears to be adequate, in that it is derived from reported data of the American Samoan Office of Immigration" (CPR P-25, No.423, 1969). But even a cursory inspection of the data does not warrant this statement. Table A8 presents a consolidated annual report of the Immigration Division for 1959-70. (Unfortunately, the data for a six-month period, January-June 1968, is missing but it should not alter the general picture.) Other than the first three years 1959-61, each year shows a large volume of net immigration. According to this table, during 1960-69, which roughly corresponds to the intercensal period, there were as many as 10,379 more arrivals than departures. (Actually, the number should be more since the data on Western Samoans are shown from 1961.) Even if we take into consideration mortality among the immigrants and a certain time lag between arrival and departure of tourists and business travelers, the large discrepancy between census and vital statistics data compared through a residual method still persists. As Table 2 shows, it is estimated that there was a net loss of 1,300 persons through migration between 1960 and 1970. Also, as stated earlier, the censuses show the net migration of Western Samoans during the 1960s to be 2,831. The in-migration figure of Table A8 shows an excess of 8,529 Western Samoan arrivals during 1961-70, however. (The official statistics of Western Samoa show a net in-migration from Pago Pago since 1965 [Economic Development Board, Western Samoa, 1966].)

Besides, the more than 10,000 excess arrivals during the 1960-69 mean that nearly 40 percents of the 1970 census population came to the territory over the past ten years. Since an over-counting of passengers is less likely than an under-counting, it is suspected that there are more flaws in the departure statistics than in the arrival statistics.

When the data from the Immigration Division are compared with those from the Office of Tourism, further discrepancies appear. For instance, Table A9 presents the air arrivals (excluding Polynesians) during January-June 1970 by source of data. The Immigration Division provides consistently larger figures than the Office of Tourism. Most conspicuous is the category of "transients," in which the Immigration figure is about 30 times that of the Tourism Office. (Actually the Immigration Division uses the term "transient," whereas the Office of Tourism uses the term "transit." The former defines a transient as "one who remains on the island for 24 hours or less—one who is "in transit' from on point to another and is 'passing through' Samoa" [letter from Marcus, January 31, 1972].) Each month in 1970 there were far more transient arrivals than transient departures, according to the monthly report of the Immigration Division. In the first half of the year there were 9,439 such arrivals (both air and sea) and 8,105 such departures; in the second half, 18,570 against 17,098. If transients are only "passing through" American Samoa, there should be the same number of arrivals and departures.

Discussion and Recommendations

It is evident that the GAS agencies need to coordinate their demographic activities. Two or more offices are involved in collecting the same data, and this results in duplication, confusion, and low quality of statistics. Creation of a central statistical coordination body is desirable because it could provide technical and administrative guidelines for the improvement of demographic and related statistics of the territory.

Although the current coverage of birth and death registration is satisfactorily complete, reporting and statistical processing of vital data requires further review. In the United States local health departments are the sole registration unit and vital statistics are produced through the chain of health agencies. IN the territory, plenuu, health agency, and registrar are all involved in the registration, and final custody of the legal document is with the registrar. Somewhat conflicting statistics are produced, at least by two agencies. The accuracy of birth data collected by the Office of Samoan Affairs should be questioned. In the first place, the coverage is extremely low in comparison with the vital registration. Second, the data have no legal value, yet they are collected to establish the nativity of American Samoans, according to the Office of Samoan Affairs.

The birth and death certificate forms currently used in the territory (GAS Forms 130 and 553, Figures A5 and A6) should be revised for further clarification of terms and inclusion of additional basic item. For instance, on the current birth certificate it is not clear whether "number of previous births" includes only live births or both live births and fetal deaths. Even though a great majority of births take place in the hospital and dispensaries, medical information such as birth weight or complications and malformations is not collected. Adoption of the nationally recommended standard certificates should be considered. (See National Center for Health Statistics: Vital and Health Statistics Series 4, No. 8, 1968 Revision of the Standard Certificates.) A provision of new forms for delayed reports is also necessary.

Extension of the tabulation scheme should be explored. Since there are only about 1,200 births and deaths annually, the introduction of a marginal punch card system alone would greatly facilitate accurate processing of the more complicated tabulations. The

basic tabulations should conform to the internationally recommended annual program listed in the <u>Handbook of Vital Statistics Methods</u> by the United Nations.

A comprehensive overhaul of the migration statistics system should be undertaken. Strong administrative control should be exercised over the flow of entry clearance and embarkation cards, which are the basic material for migration statistics. These forms require careful study for further improvement. A new arrangement of information items being collected is suggested so that each agency can tear off its own portion of the forms and use it independently. The terms used in the forms should be clearly defined and the definitions uniformly understood by the offices and officials concerned. For any particular item in the form, a consistent classification system should be applied to all passengers, and mixing of several classification schemes should be avoided. Improvement of statistics on the departing passengers I especially important. Embarkation cards with proper design and information items should be given to all passengers, including residents of the territory.

The state of demographic statistics in the territory strongly calls for training of qualified personnel. The GAS should seek active participation in one of the short-term training programs offered by several population centers so that the demographic statistics may be improved without outside assistance.

Development of a more adequate system of protection and maintenance of Demographic data is also urgently required. The current system of storage is, with the exception of medical records, extremely confusing. The recovery of reports of even the immediate past often requires painstaking search. Methods of storage, retrieval, and safety from destruction should be strengthened.

<u>Estimation of Population</u>

In theory, the estimation of current total population or past populations of the territory is simple. Components needed are the natural increase and net migration that occurred between the previous census date and the time of estimation. The procedure is expressed as:

$$P_i = P_o + B_i - D_i + (IM)_i - (EM)_i$$

Where

P_i = estimated population at time i

P_o = enumerated census population at time o

B_i = number of births in the interval o to i

D_i = number of deaths in the interval o to i

$(IM)_i$ = number of immigrants in the interval o to i

$(EM)_i$ = number of emigrants in the interval o to i

On the assumption that the census coverage is reasonably complete, the additional required condition in this simple method, often called the balancing equation method, is accurate vital and migration statistics. As we have seen in the foregoing section, although the degree of completeness of birth and death registration in the territory is high, migration statistics are not reliable. Since the territory is accessible by two ports, accurate migration records theoretically should not be too difficult to collect. Unfortunately,

however, accurate migration data are not available, and therefore some other method to estimate the current and past population must be sought. Even if accurate migration records were kept, estimation by district or other subarea would require techniques beyond those of the balancing equation method. In this section discussion centers on (a) methods currently employed for estimating population in areas subjected to migration, (b) inquiry of symptomatic data of population in the territory, and (c) an approach currently usable for estimating the territory's population.

Review of Methods used for estimating population

Techniques currently employed for the estimation of population for subareas include: vital rates method, component method II, composite method, regression method, and housing unit method. None of these methods is found to be definitely superior to the others. For the county and metropolitan estimates, the Bureau of the Census favors an average of several methods, supplemented by any available recent special censuses or surveys (CPR P-25, nos. 427 and 432, 1969). For the post-censal estimates of American Samoa the Bureau made five estimates annually from 1965. Table A10 presents a summary of these estimates. They are frequently inconsistent, demonstrating the difficulty of estimation for the territory. For instance, for 1965, the 1966 estimate gives a figure of 21,400 , the 1967 estimate 24,700, and the 1968 estimate 25,000.

When reliable vital statistics are available, the vital rates method may yield simple, rapid, and effective estimates. Changes in the number of births and deaths reflect changes in population and vital rates. If there is a reliable estimate of trends in crude birth and death rates, the population may be estimated by means of the following formula:

$$P_i = \tfrac{1}{2} \left(\frac{B_i}{b_i} + \frac{D_i}{d_i} \right) \times 1,000$$

where

P_i = estimated population at time i
B_i = number of registered births for one-year period centering time i
D_i = number of registered deaths for one-year period centering time i
b_i = estimated crude birth rate at time i per 1,000 population
d_i = estimated crude death rate at time i per 1,000 population

While this method provides, quite often, fairly good estimates for states and large areas, for American Samoa it must be used with caution. Since the population size is so small, annual fluctuations in the number of births and deaths, especially of the latter, may be random rather than the result of changes in population size. Furthermore, migration is age and sex selective, and birth and death data may reflect the population composition more than the total size in the territory. Annual estimates since 1960 are given in Table A11, using the vital rates method.

Component method II has been used extensively by the Bureau of the Census in making regional, state, and county estimates. To estimate the population change, the components of natural increase and migration are separately determined. Natural increase

is taken simply from vital records. Civilian migration is estimated from school enrollment. The population change in the armed forces and institutions is usually obtained from independent sources. The estimating formula is:

$$P_i = P_o + B_i - D_i + M_i - M_i + A_i$$

Where

P_i = estimated population at time i

P_o = civilian resident population at time o

B_i = number of births in the interval o to i

D_i = number of civilian migration in the interval o to i

M_i = estimated net civilian migration in the interval o to i

M_a = estimated net movement of civilians into the Armed Forces in the interval o to i

A_i = number of persons in the Armed Forces stationed in the study area at time i

Since the size of the armed forces is neglible in the territory (five in 1960 and ten in 1970), the problem is reduced to obtaining the school-enrollment data that are used for estimating migration. Unfortunately, the relationship between school-age migration and the total migration, which is crucial for this method, is not known for the territory. There are also some problems with the school-enrollment data.

Separate age-specific estimates derived from various symptomatic data are part of the techniques of the <u>Bogue-Duncan composite method.</u> Birth data are used to estimate the number of females of childbearing age. Using the sex ratio, it is possible to estimate the number of males of corresponding age. The number of children under five years of age is obtained from fertility ratios. School enrollment statistics provide an estimate of the population from age five to childbearing age. Lastly, an estimate of the elderly population is derived from death statistics on old persons. This method provides a population estimate by broad age group. Even though birth, death, and school enrollment data may be too erratic for estimating independently the total population of the territory, they can be useful for estimating specific groups of the population, and errors may cancel out when the components are added to estimate the total population. A modification of this method is suggested in the section "An Approach to Estimating Population for the Territory" (p. 48), and the procedure is illustrated in Appendix C.

The <u>multiple regression method</u> is based on the assumption of a stable linear relationship between growth of population and change in a combination of symptomatic variables. In the United States such variables as vital events, school enrollment, automobile registrations, sales tax, and nonagricultural employment are used as symptoms. The method is powerful in breaking down a known estimates for a parent population (e.g., a state) into estimates for subareas. It requires population and symptomatic data of areas for the preceding two census years. Because a series of such symptomatic data are lacking for the territory, the procedure may be developed only in the future.

Change in the number of existing housing units since the benchmark year is also indicative of change in the population during the interval. The <u>housing unit method</u> is developed to estimate population growth by multiplying the average number of persons per household by the number of new dwelling units. The latter data may be obtained from the official records of building permits and demolitions or from public utility statistics. In the territory, owing to the lack of appropriate data as discussed in the next section, this method is not presently feasible.

<u>Reliability of Symptomatic Indicators</u>

In the absence of accurate vital or migration statistics, population changes are measured through changes in symptomatic variables. The quality of such variables is therefore essential for a useful estimate of population. This section discusses the adequacy of selected variables normally sensitive to population changes.

<u>School enrollment.</u> Until 1969 the <u>Annual Report of the Governor</u> used to include school enrollment statistics. Consolidated data from the <u>Annual Reports</u> and data supplied directly by the Department of Education for 1969, 1970, and 1971 are shown in Table 4.

Table 4. Elementary School Enrollment, American Samoa: 1960-71

Year	Grade	Enrollment	Year	Grade	Enrollment
1960(a)	1-6	4,590	1966	1-8	6,715
1961	1-6	4,273	1967	1-8	6,684
1962	1-6	4,534	1968	1-8	6,757
1963	1-6	5,142	1969	1-8	7,415
1964	1-6	5,258	1970	1-8	7,193
1965	1-6	4,988	1971	1-8	7,294

(a) Includes students enrolled in private schools.

As indicated earlier, the usefulness of these figures for estimating migration of the entire population is limited. First, the relationship between migration of school children and total population is not known. Second, over a period of time the educational system has been modified and extended. When the current educational system was established in 1962-64, the former junior high schools were abolished and eight-year elementary schools were established (Wolf Report, 1969). A discontinuity in the range of grades, therefore, is observed between 1965 and 1966. The enrollment rate has apparently improved over time; it was cited as 85 percent in 1960 and 99 percent in 1970 (GAS 1973 Program Memorandum). According to the census, however, for children 7-13 years of age enrollment was 89.2 percent in 1960 and 90.8 percent in 1970, indicating only a slight gain over the ten-year period.

The enrollment figures published in the <u>Governor's Report</u> have been consistently higher than those obtained by the census. In 1960, 4,305 children were enumerated by the census as attending elementary school grades 1-6, compared with 4,590 reported in the GAS report. In 1970 the figures were 6,715 and 7,193, respectively, for grades 1-8. The over count in the GAS report amounted to 6.6 percent in 1960 and 7.1 percent in 1970. This may be due partly to a difference in reference time. The census is taken on April 1

and the GAS enrollment figure is as of June 30. The method of obtaining enrollment statistics may also differ between the two series. Clearly, the census school population refers to attendance at a given time. In case of the GAS report however, individual school may have reported total enrollment of the year including students who withdrew or transferred during the school year.

The census data of 1960 indicate that the elementary school enrollment is most sensitive to the population 8-15 years of age, the rate of enrollment being over 90 percent. For ages 5 and 6, only 12.9 percent were enrolled in the elementary school. Whether enrollment among these groups has changed during the past decade or not is not known, since the 1970 data provide the total enrollment including nursery school and kindergarten. It is probable that the enrollment data may be best used for estimating the population of 7-14 years of age.

Because of the change in the school system and improvement in the enrollment rate in the past, a careful investigation of the correlation between age and grade and of the change in enrollment by age should be undertaken to strengthen the use of school statistics for population estimation.

Voter registration. The register of voters, which should be sensitive to the population size of adults, is kept by the Office of Samoan Affairs. It appears to be initiated by the Office in cooperation with plenuus rather than by the voluntary registration of voters. A long and careful process is followed to correct the original register by removing or adding the transfers, movers, deceased, and aliens. The register is renewed every two years for the election of senators and representatives of the territory. Since the voting age is 18 and over, nearly 50 percent of the total Samoan population should be on the list. Table A12 presents the voter register for 1968 and 1970 by district together with the 1970 census population. The proportion of the population in the register differs widely from district to district. Three districts that contain off-islands (Manu'a Islands) and East Vaifanua County show, for some reason, very high percentages. Other than these and districts 4 and 6, the percentage centers around 28 percents. Although the percentage is unusually low, in view of the frequency of registration, there is potentiality here for effective use of the data to estimate the current population by county or districts

Housing Statistics. Building permits issued by the GAS are available from FY 1964. The number fluctuates very much from year to year as seen from the following table:

Year	Number
1964	194
1965	111
1966	193
1967	89
1968	806
1969	588
1970	264

Whether this is related to budgetary apportionment or some other matter is not clear. In any case it does not seem to reflect population change. Furthermore, the data lack information on demolition and vacancy. They do not appear to be useful for estimating population at the present time.

The electricity utility statistics date from 1967 only. It is therefore too early to determine any relationship between the utility statistics and population changes. There are two potential measurements—number of installations served, and kilowatt hours sold. To establish the relationship between utility consumption and population, a correlative study of these variables over a period of time is necessary. Separation of domestic and industrial use should be also attempted.

Health Statistics. Utilization of health data is promising. Medical care is provided practically free of charge. Consequently, all socioeconomic and age groups seem equally to seek medical care. The record keeping at the Department of Medical Services is excellent. Although statistics on in-patients and out-patients may be influenced by the incidence of disease at particular times, the feasibility of using such statistics for estimation of population should be investigated. Patient statistics that are not influenced by epidemics, such as dental clinic visits, may become a new tool for estimating population. The school health unit keeps records of student from each school. These records should complement the enrollment statistics of the Department of Education.

The most promising data are found in the filariasis program. Since 1970 complete village censuses have been taken as part of the program activities. A number was given to each dwelling unit, and public health nurses took a careful census with the cooperation of plenuu. Of necessity, villages are covered at different times. (This "rolling census" took two years to complete, from March 1970 to February 1972.) The program keeps individual registry cards, however (see Figure A7), and utmost care is taken to keep the file current by removing, adding, and reshuffling cards in accordance with the reports of public health nurses in the field. Although adjustments are needed for a few villages, there is a very close agreement between the national census and the filariasis census concerning the total population by island. IN general, a high degree of correlation between the two censuses exists for the population of each village as well. But in a very few villages extremely large disparities were observed, and certain villages listed in the filariasis program could not be located in the census report or vice versa. For these villages miscoding or different interpretations of jurisdiction are suspected. There is a further dividend in the use of the filariasis census; it gives the composition of population by age and sex. Incorporation of the filariasis census with the composite method will probably yield the most profitable population estimate in the territory.

Other Data. Other symptomatic variables such as automobile registration and income tax files are relatively new statistics in the territory. Tax returns are available from 1964, but these figures are affected by the employment rate and the age composition of the population. For purposes of population estimation, a study of the past correlation of these variables with population is necessary.

Currently cars are in great demand in the territory. Automobile registration is generally considered to reflect the frequency of new car shipments rather than population change.

An Approach to Estimating Population for the Territory.

When estimation is made through a manipulation of symptomatic variables in the territory, there are two conspicuous factors that make a valid estimation of population extremely difficult. The first is the smallness of population. The total size being only 27,000 in 1970, any quantitative phenomenon that is supposedly closely related to a

change in population is subjected to a large random fluctuation. An estimate based on these symptomatic series is therefore likely to have a large margin of error.

The second factor is migration. As discussed earlier, a large number of persons, relative to the size of the population of the territory, selectively move back and forth. Motivating and forcing factors of migration are not restricted to American Samoa, but also concern Western Samoa and Hawaii. With facilitated means of transportation, the size and direction of migration are not effectively predictable. Without accurate bookkeeping on migration, past estimates for the territory have been conflicting, as has been demonstrated by the Bureau of the Census estimates shown in Table A10.

A procedure of estimating population is documented in this section. It should be emphasized that there are numerous approaches one can take to estimation. Furthermore, as new data become available and statistics are improved, a constant examination and revision of the procedure should be attempted.

In developing a method of estimation, a few limitations had to be taken into consideration, such as availability of reliable and sensitive symptomatic data, timely retrieval of such data, simplicity and flexibility of computational techniques, and presentation of estimate in a format of broad age structure. Although voter registration and health statistics have high potential utility value, it seems that only birth, death, and school enrollment may serve as effective symptomatic variables, at least for the time being.

Basic strategy of estimating population by broad age group.

The Bogue-Duncan composite method is probably best suited for estimating the population of the territory in view of the kinds of symptomatic variables available and the desirability of obtaining estimates by broad age groups. From birth statistics, adults 18-49 years of age will be estimated. For children below seven years of age, accumulated birth statistics and the child-woman ratio will form the base of estimation. Death statistics will be used for estimating the population of 50 years and over. Finally, the enrollment ratio will determine the school-age population of 7-17 years. If possible, for each group two different estimates are made and the average of the two is taken as the final estimate of the age group.

Total enrollment figures for the elementary school level are available annually. Unfortunately, there is a serious jump in the series between 1965 and 1966, as already mentioned, when elementary schools switched from a six-year to an eight-year system. The 1960 census report shows that the enrollment ratio jumps to 75 percent at age seven, but at age six the ratio is merely 20 percent for males and 52 percent for females. Even ag age 17, over 75 percent of the students were in elementary school in 1960. It is thought that in 1970 a smaller proportion of students of this age were still enrolled in elementary school. Regrettably, the 1970 census report does not give the tabulation by grade and age. However, in both censuses, the overall enrollment ratio for 7-17 years of age, disregarding grades, is similar to that shown in Table 5. Furthermore, if the voters' registry were to be used for estimating population in the future, it would be convenient and useful to create a category ending at age 17. Therefore, we decided to use the enrollment statistics for estimating the population aged 7-17. In the actual procedure, owing to the gap in the data between 1965 and 1966, we applied two different attendance ratios, computed from the experiences of 1960 and 1970, to other years—the 1960 ratio for years 1965 and before, and the 1970 ratio for 1966 and later.

Table 5. School Enrollment for Ages 7-17, American Samoa: 1960 and 1970

| | Population | | Enrolled in school | | | |
| | | | 1960 | | 1970 | |
Age	1960	1970	Number	Percent	Number	Percent
7-13	4,325	5,622	3,859	89.2	5,103	90.8
14-15	1,099	1,343	986	89.7	1,147	85.4
16-17	959	1,299	747	77.9	964	74.2
7-17	6,383	8,264	5,592	87.6	7,214	87.3

For the age group 18-49, two estimates were made: one from the number of births in the year of estimation, the other from the births of two successive years. The latter was taken with the purpose of smoothing annual fluctuations in births. One can take a three-year average, but this technique will not work for the current estimation, for the births in the following year are one of the components. The ratios of births to the female population of 18-49 years of age were calculated for the two census years and an interpolation was made for other years. These recorded ratios and births would be used for estimating the size of the population of reproductive women. The proportion of female population in this age group was applied to obtain the total population 18-49 years. The final estimate was the average of the two procedures.

To estimate preschool-age population, two different procedures were also followed. First, a count of births occurring five years before the estimation time was made. Estimated survival ratios were applied tot his accumulation of births to derive the population under five years of age. Then the ratios of the population 0-4 years to the population of 0-6 were applied to derive the population under age seven. Another series of estimates was made from the ratio of children under seven to women of 18-49 years, which had been already estimated. Again, the final estimate was the average of the two procedures.

For age group 50 years and over, estimates were made from the death-recorded fort his age group and linear progression fitted to successive census, figures. Excluding infant mortality, the deaths in over 50 years of life occupy about 50 percent of the total deaths recorded in the year. As a great majority of births take place in hospital, it is assumed that there are no cases of "age unknown" among the infant deaths. Consequently, it was determined that 50 percent of the total "age unknown" deaths were deaths of persons 50 years of age and over. The death rate for this age group was applied to the number of deaths to obtain the population. It is also expected that little migration takes place among person of old age. This is the rationale followed in making another series of estimates by a linear progression. As before, the finale estimate was the average of the two methods.

A numerical illustration of the step-by-step estimation procedure is presented in Appendix C. Table A13 and Figure 4 show the annual estimations of the territory for 1960-71. From these techniques of estimation, it appears that during the period 1960-62 there was no increase in the population, but considerable growth took place in 1963-66, followed by another short stagnant period. **(Click here to see Figure 4.)**

Population Projections

 In this section the population of the territory is projected up to 1990 by age and sex under four different sets of assumptions that depend on levels of fertility and migration.* A fixed mortality schedule is assumed for all projections; the survival ratios by age and sex based on the mortality assumed are shown in Table A14 and A15. These four sets of assumptions are:

    Projection I Constant Fertility and no migration
    Projection II Declining fertility and no migration
    Projection III Constant fertility and constant migration
    Projection IV Declining fertility and constant migration

Fertility Assumptions

 Two different sets of age-specific fertility rates are assumed in the projections. One set is taken from the average rates for 1959-61 and 1969-70; this set is assumed to prevail through the following 20 years, providing a basis of Projections I and III. Another set assumes declining fertility; for each age group of women a successive 5 percent

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*A word of explanation is necessary to distinguish "estimate" and "projection" of population as used in this report. Whereas an estimate is intended to determine with a certain degree of exactitude the size of the total or a portion of the unknown population (past, present, or future), a projection indicates future population processes that would take place in a given population under assumed conditions. Therefore, a projection may or may not predict the future population likely to occur.

Reduction of fertility is assumed to take place every five years. For the period 1970-75, the initial period, the fertility rates used for Projection I and III are applied, except for the age groups 25-29 and 30-34 for which 1969-70 observed rates were substituted. Projections II and IV are based on these declining fertility assumption. The numerical values of these fertility rates are shown in Table A16.

Migration Assumptions

 Projections I and II are intended to present the population processes in the absence of migration. Assumptions regarding future migration are most tantalizing to make. The six-fold difference in the growth rate between 1950-60 and 1960-70 is practically entirely due to change sin migration. The Wolf Report (1969) asserted that

territorial migration was "rooted in economics" and assumed, from the 1950 and 1960 censuses, that 85 percent of the natural increase would emigrate in a situation of static employment or, conversely, that an increase in employment totaling 85 percent of natural increase would nullify the migration. During 1960-70, however, emigration decreased to a level of 15 percent of the natural increase, even though employment declined from 54.6 percent in 1960 to 34.3 percent in 1970 for the population 14 years and over, according to the census.

The age pattern of migration also changed considerably. From 1950 to 1960 the emigration rate was highest among those 15-19 years of age, with 54 percent of the males and 32 percent of the females leaving (see Table A3). For older persons the rates were lower, and there was actually net immigration at the ages of 55 and over. In the following decade emigration was lowest among young children, higher among children aged 5-9, and highest among teenagers. By age 20-24, a large net immigration was observed among males; among females a similar trend occurred but was less pronounced, resulting in no substantial migration after the teens, (As indicated earlier, the 1970 population in the ages groups 30-44 was actually larger than the original cohort in 1960.) The reduction of emigration in early life after 1960 is plausible. As Table A1 shows, in Hawaii alone there have been about 300 Samoan births annually since the early 1960s. Some of these children must have accompanied their parents when they returned to the territory, which offset the migration of their counterparts from the territory. Both of the last two decades could have been unusual for Samoan migration. With the change in administration and a decline in economic activities, a spur to emigration appears to have been in effect in the 1950s. The slackening of migration in the 1960s may be due partly to a reaction to the massive emigration of the previous decade, especially if we consider the net immigration then occurring amount the age groups that had experienced tremendous emigration earlier.

The territory's statistics show a consistent net immigration of Western Samoans, but owing to the new "restrictions which make is very difficult for West Samoans to reside and work in American Samoa" (Western Samoa, Economic Development Board, 1966) the inflow to the territory may taper off in the future. (In fact, according to this Western Samoa source, since 1965 there had been a reversal of the out-migration to Pago Pago. Until that time, net migration into the territory amounted to about 1,000 persons annually.)

In projecting population we have arbitrarily assumed that the average of migration trends between 1950-60 and 60-70 would prevail in the future. Other than fluctuations from age to age, a technical problem exists in converting the estimated decade rate of migration to quinquennial rates. Fortunately, as the migration rate from five-year births to the age group of 0-4 years can be determined easily through a residual method, an assumption of additivity between five-year and ten-year migration rates makes it possible to estimate very crude five-year migration rates.

A free-hand curve was fitted to these five-year migration rates by age for each of 1950-60 and 1960-70 data. Averages of two age-specific rates read from these curves were assum3d to prevail during the following 20 years. The numerical values are given in Table A17. Projection III is made under the assumption of this set of age-specific migration rates and the constant fertility used for Projection I, and Projection IV is made with the combination of the above migration and the declining fertility of Projection II.

Discussion

Results of these projections by broad age groups, percentage changes relative to the 1970 population, and age structure for each reference time are shown in Table 6-8. (The detailed projections by age and sex are given in Tables A18-A21.)

Increase by age group. Under the assumption of no migration and constant fertility, the population would more than double in 20 years, becoming over 56,000 in 1990. An assumption of migration checks population growth more than an assumption of declining fertility. However, even with continued migration the population would increase by nearly 50 percent in 20 years, and with both migration and declining fertility it would increase by nearly 40 percent. With constant fertility the rate of population increase would accelerate over the years. Density would grow to 744 per square mile under Projection I and to 490 under Projection IV by 1990.

The difference in the total size stems principally from the age structure. The effects of declining fertility are immediately felt under age 15. Since migration is age-selective, being concentrated in the late teens and the 20s, the proportion of this group is depleted in Projections III and IV. This group, in turn, has the influence of lowering the number of births, for it is the major childbearing group.

Table 6. Population Projections by Broad Age Group, For American Samoa: 1970-90

Age Group	1970(a)	1975(b)	1980(b)	1985(b)	1990(b)
Under 15					
Projection I	12,879	14,780	17,510	21,860	26,930
Projection II	12,879	14,550	16,650	19,760	23,100
Projection III	12,879	14,000	15,240	17,130	19,290
Projection IV	12,879	13,790	14,520	15,540	16,610
15-59					
Projection I	13,251	16,130	19,490	22,980	27,320
Projection II	13,251	16,130	19,490	22,980	27,100
Projection III	13,251	14,430	15,810	17,110	18,550
Projection IV	13,251	14,430	15,810	17,110	18,380
60 and over					
Projection I	1,029	1,290	1,610	1,910	2,310
Projection II	1,029	1,290	1,610	1,910	2,310
Projection III	1,029	1,300	1,620	1,910	2,270
Projection IV	1,029	1,300	1,620	1,910	2,270
Total (c)					
Projection I	27,159	32,200	38,620	46,750	56,560
Projection II	27,159	31,970	37,750	44,660	52,500
Projection III	27,159	29,730	32,660	36,150	40,110
Projection IV	27,159	29,520	31,950	34,560	37,260

Note: Projection I assumes constant fertility and no migration; Projection II assumes declining fertility and no migration. Projection III assumes constant fertility and constant migration; Projection IV assumes declining fertility and constant migration.
  (a) Census population
  (b) Population rounded to nearest 10.
  (c) Individual age groups may not add to totals owing to rounding errors.

Table 7. Population Projections as Percent of the 1970 American Samoan Population by Broad Age Group: 1970-90

Age Group	1970(a)	1975	1980	1985	1990
Under 15					
Projection I	100.0	114.7	136.0	169.7	209.1
Projection II	100.0	113.0	129.3	153.5	179.4
Projection III	100.0	108.7	118.3	133.0	149.8
Projection IV	100.0	107.1	112.8	120.7	128.9
15-59					
Projection I	100.0	121.8	147.1	173.4	206.2
Projection II	100.0	121.8	147.1	173.4	204.5
Projection III	100.0	108.9	119.3	129.1	140.0
Projection IV	100.0	108.9	119.3	129.1	138.7
60 and over					
Projection I	100.0	125.4	156.4	185.8	224.2
Projection II	100.0	125.4	156.4	185.8	224.2
Projection III	100.0	126.2	157.4	185.8	220.5
Projection IV	100.0	126.2	157.4	185.8	220.5
Total					
Projection I	100.0	118.6	142.2	172.1	208.2
Projection II	100.0	117.7	139.0	164.4	193.3
Projection III	100.0	109.4	120.3	133.1	147.7
Projection IV	100.0	108.7	117.6	127.3	137.2

Note: Projection I assumes constant fertility and no migration; Projection II assumes declining fertility and no migration; Projection III assumes constant fertility and constant migration; Projection IV assumes declining fertility and constant migration.
  (a) Census population.

Table 8. Percent Distribution of Population Projections by Broad Age Group, For American Samoa: 1970-90

Age Group	1970(a)	1975	1980	1985	1990
Under 15					
Projection I	47.4	45.9	45.4	46.7	47.6
Projection II	47.4	45.5	44.1	44.2	44.0
Projection III	47.4	47.1	46.6	47.4	48.1
Projection IV	47.4	46.7	45.4	45.0	44.6
15-59					
Projection I	48.8	50.1	50.5	49.2	48.3
Projection II	48.8	50.4	51.6	51.5	51.6
Projection III	48.8	48.5	48.4	47.3	46.2
Projection IV	48.8	48.9	49.5	49.5	49.3
60 and over					
Projection I	3.8	4.0	4.2	4.1	4.1
Projection II	3.8	4.0	4.3	4.3	4.4
Projection III	3.8	4.3	5.0	5.3	5.6
Projection IV	3.8	4.4	5.1	5.5	6.1
Total					
Projection I	100.0	100.0	100.0	100.0	100.0
Projection II	100.0	100.0	100.0	100.0	100.0
Projection III	100.0	100.0	100.0	100.0	100.0
Projection IV	100.0	100.0	100.0	100.0	100.0

Note: Projection I assumes constant fertility and no migration; Projection II assumes declining fertility and no migration; Projection III assumes constant fertility and constant migration; Projection IV assumes declining fertility and constant migration
  (a) Census Population

By 1990, the assumption of no migration and constant fertility (Projection I) would result in an increase of over 200 percent of the 1970 population in each of the three broad age groups, the smallest increase being observed in the productive ages. Projections II would yield a considerably smaller increase in children under age 15, but in all other ages about the same increase would be observed as with Projection I. With migration assumed

up to 1980, the increase in the number of old persons would be slightly faster, but from then on it would become much slower than under the assumption of no migration.

Change of Age Structure. (Table 8) Although the migration assumption would yield a relatively small increase of population, it would result in a smaller proportion of persons of productive age (15-59 years) than would the assumption of no migration. When migration and constant fertility are combined (Projection III), the proportion of persons in this age group would decline at an accelerating rate over the time. If no migration and constant fertility were to prevail, the proportion would slightly increase in the first ten years, but afterward a fast depletion would be observed in this age group. If fertility were to decline, the proportion of those in the productive age group would increase, especially if there were no migration.

The proportion of children under 15 would steadily decrease over the years in Projections II and IV. The constant fertility assumption would cause an increase in the proportion of children under 15 after 1980. The heaviest burden of children would occur under the assumption of both constant migration and constant fertility (Projection III), surpassing 48 percent in 1990.

If no migration is assumed, the proportion of the old-age group would be stabilized from 1980 onward following an increase during 1970-80. In Projection III and IV the group would keep increasing; in the latter case, the aged would constitute more than 6 percent of the total population in 1990.

It should be noted that under the assumption of constant fertility the burden of dependency would increase more and more. This trend becomes specially pronounced with the additional assumption of migration, though migration may ease the total population pressure. Even with continuing migration, which eliminates the productive group more selectively, if fertility were to decline the proportion of persons 15-59 years of age would be stabilized at least in the next 20 years. If a reduction of dependency contributes to elevating the living standard of the inhabitants and increasing productivity, it follows that a policy to encourage fertility reduction should be promulgated.

Birth rates and death rates. Crude birth rates and crude death rates ensuing from different assumption are shown in Table 9. Under Projection I the birth rate would keep increasing through 1980-85, reaching more than 43 per 1,000.

Table 9. Projected Annual Crude Birth and Death Rates Per 1,000 Population, for American Samoa: 1970-90

Projection (a)	1970-75		1975-80		1980-85		1985-90	
	Crude birth rate	Crude death rate	Crude birth rate	Crude death rate	Crude birth rate	Crude death rate	Crude birth rate	Crude death rate
I	40.2	6.2	42.3	6.1	43.6	5.4	43.1	5.1
II	38.7	6.1	39.1	6.0	39.0	5.4	37.4	5.2
III	39.7	6.2	40.6	6.3	41.6	6.0	41.8	5.9
IV	38.3	6.1	37.6	6.2	37.2	6.0	36.4	6.0

(a) Projection I assumes constant fertility and no migration; Projection II assumes declining fertility and no migration; Projection III assumes constant fertility and

constant migration; Projection IV assumes declining fertility and constant migration.

This is due to an increase in the childbearing population, even if age-specific fertility remains constant. On the other hand, the crude death rate would continue to decrease to about 5 per 1,000. A similar trend is observable with Projection III, under which the death rate is slightly increase and the birth rate slightly reduced. Even though the age-specific fertility rate progressively declines, only after 1985 would a reduction of the overall birth rate ensue. If migration is assumed to occur in addition to declining fertility, however, a steady decrease in the birth rate would be observed. Crude death rates are similar in Projections I and II and in Projections III and IV.

      The natural growth rate would keep increasing, with or without migration, as long as fertility remained constant. It would reach 3.8 and 3.6 percent per annum in 1980-90 under Projections I and III, respectively. Under an assumption of declining fertility and no migration a decrease in the natural growth rate, as in the birth rate, would be seen only after 1985. Projection IV would bring about steadily declining annual rate of natural increase that would finally reach about 4 percent in 20 years. It is a declining age-specific fertility rate, not migration that would result in a reduction of the rate of natural increase.

APPENDIX A
Tables

Table A1. Vital Statistics Data on Samoans in Hawaii: 1963-70

| Year (a) | Births, by race of | | | Fetal Deaths(b) | Deaths (all ages) | Marriages | |
	Child	Mother	Father			Bride	Grooms
1963	289	331	256	18	27	106	78
1964	281	298	243	9	24	128	89
1965	285	311	242	11	27	87	67
1966	310	328	272	10	26	69	60
1967	278	300	235	8	19	84	65
1968	124	113	118	15	22	115	98
1969	146	148	120	19	35	92	85
1970	288	306	244	47	37	124	131

(a) Prior to 1963 Samoans are included in "other races."

(b) By race of mother.

Table A2. Percent Dsitribution of Population, by Age and Sex , for American Samoa: 1950, 1960, and 1970

Age	Males and Females			Males			Females		
	1950	1960	1970	1950	1960	1970	1950	1960	1970
0-4	18.7	18.5	17.3	18.7	18.9	17.4	18.6	18.1	17.1
5-9	15.2	16.2	16.2	15.7	16.6	16.2	14.6	15.7	16.3
10-14	12.4	14.9	13.9	12.6	15.6	13.7	12.2	14.3	14.1
15-19	11.4	10.9	11.4	11.6	11.69	11.7	11.2	10.2	11
20-24	8.6	7.2	8	7.9	6.6	7.4	9.4	7.8	8.6
25-29	8.1	5.8	6.2	7.9	4.8	6.3	8.2	6.8	6
30-34	6	5.5	5.6	6.2	4.8	5.7	5.7	6.2	5.6
35-39	5.3	5.1	4.6	5.4	5	4.5	5.2	5.2	4.6
40-44	3.4	4.1	4.3	3.3	4.2	4.1	3.6	3.9	4.4
45-49	3.2	3.4	3.4	3.3	3.5	3.5	3.1	3.4	3.4
50-54	2.6	2.4	3	2.5	2.6	3.2	2.7	2.2	2.8
55-59	1.4	2.1	2.3	1.4	2.3	2.5	1.5	2	2.1
60-64	1.3	1.2	1.3	1.1	1.1	1.4	1.6	1.4	1.3
65-69	1	1.1	1.2	1.1	1	1.2	0.8	1.2	1.2
70-74	0.7	0.7	0.5	0.7	0.6	0.5	0.7	0.8	0.6
75 and over	0.7	0.8	0.7	0.6	0.8	0.6	0.8	0.9	0.9
Total	100	100	100	100	100	100	100	100	100
Under 15	46.3	49.6	47.4	47	51	47.3	45.4	48.1	47.5
Over 65	2.4	2.7	2.4	2.4	2.5	2.2	2.3	2.9	2.7
Median Age	16.6	15.2	16.1	16.3	14.6	16.1	17	15.8	16.1

Table A3. Estimated Age- and Sex-Specific Migration Rates Per 1,000 Population, Obtained by a Residual Method, for American Samoa: Intercensal Periods 1950-60 and 1960-70

Age		Males		Females	
From	To	1950-60	1960-70	1950-60	1960-70
0(a)	0-4	-3.3	-5.7	-5.5	-4.4
0(b)	5-9	-7.9	-2.9	-11.6	-0.3
0-4	10-14	-11.1	-0.4	-14.3	7.3
5-9	15-19	-21.9	-3.9	-23.2	-3.6
10-14	20-24	-43.6	-34.3	-28.7	-16.7
15-19	25-29	-54.3	-24.4	-32.2	-17
20-24	30-34	-32.4	18.8	24.4	-0.8
25-29	35-39	-29.3	32.2	-27.3	-4.5
30-34	40-44	-24.3	20.2	-22.2	0.3
35-39	45-49	-26.8	-1.2	-23.3	-7
40-44	50-54	12.2	12.3	-26.5	3.9
45-49	55-59	-16.4	10.2	-21.3	-7.8
50-54	60-64	-34.3	-8.8	-32.2	-7
55-59	65-69	7.5	-2.6	6.6	1
60 and over	70 and over	0	-1.6	1.7	0

(a) Births during five years prior to enumeration
(b) Births during sixth through tenth year prior to enumeration.

Table A4. Average Annual Age-Sex-Specific Mortality and Corresponding Mortality Level of Coale-Demeny "West" Model Life Table, For American Samoa: 1959-61 and 1969-71

| | Mortality rate/1,000 | | | | Mortality Level | | | |
| | Males | | Females | | Males | | Females | |
Age	1959-61	1969-71(a)	1959-61	1969-71(a)	1959-61	1969-71	1959-61	1969-71
0	31.46	26.69	25.04	24.14	22	22.5	21.8	21.9
1-4	3.62	1.96	2.69	2.79	20.1	21.5	20.4	20.3
5-9	0.99	0.6	0.43	0.3	20.9	22.4	22	22.7
10-14	0.63	0.89	0.71	0.7	21.7	20.4	20.3	20.3
15-19	1.13	1.25	0.66	1.57	21.8	21.4	21.8	19.2
20-24	3.48	2.64	0.86	0.29	17.8	19.5	21.9	23.9
25-29	4.13	1.54	3.48	1.63	17.1	21.9	17.6	20.8
30-34	2.04	2.58	1.62	3.11	21.3	20.4	21.4	18.9
35-39	5.2	3.22	3.87	0.54	17.8	21.4	18.7	24+
40-44	3.09	6.48	2.62	3.9	22.1	18.2	21.8	20
45-49	15.11	5.61	4.98	5.81	12.8	21.6	20.6	19.4
50-54	10.26	8.99	9.34	6.22	20.6	21.5	18.4	21.6
55-59	12.99	18.3	6.87	19.12	22.3	18.9	23.3	13.7
60-64	29.5	38.8	12.44	17.44	17.9	12.8	22.8	20.4
65-69	15.58	55.56	16.81	18.75	24+	12.7	24+	23.7
70-74	49.75	49.02	20.83	49.38	23.1	24+	24+	19.9
75-79	130.43	31	40.65	83.33	11	24+	24+	19.4
80 and over	182.8	200	149.66	70.42	21.7	19	23.5	24+
All ages	6.3	5.87	4.38	4.4				

(a) Nonresident deaths were excluded from 1970 and 1971 data

Table A5. Age-Specific Birth Rates of American Samoan Women: 1959-61 and 1969-70

Age of Mother	1960 Female Population	Number of births, 1959-61	Average Annual birth rate per 1,000, 1959-61	1970 female population	Number of births, 1969-70(a)	Average Annual birth rate per 1,000, 1969-70
15-19	1,004	139	46.15	1,486	157(b)	52.83
20-24	774	663	285.53	1,156	666	287.56
25-29	670	710	353.23	816	516	316.18
30-34	617	564	304.7	750	344	229.33
35-39	517	294	185.56	622	255	204.98
40-44	382	117	102.09	598	88	73.58
45-49	335	16(c)	15.92	459	13	14.16
Unknown	0	63	na	0	13	na
All ages	4,299	2,566	198.96	5,889	2,052	174.22

na-- not applicable
(a) Preliminary figures.
(b) Includes one birth to mtoher under 15 years of age.
(c) includes two births to mtohers 50 years of age and over

Table A6. Birth Data by Year of Birth ande By Source, For American Samao: 1965-70

		Births reported by Office of Samoan Affairs(a)			Total births registered(b)	Percent of births reported to births registered
Year	Male	Females	Total			
1965	376	344	720		1,092	65.6
1966	445	378	823		996	82.6
1967	454	415	869		1,015	85.6
1968	444	399	843		1,052	80.1
1969	441	390	831		1,055	78.8
1970	156	157	313		997	31.4
1965-70	2,316	2,083	4,399		6,207	70.9

(a) Office of Samaon Affairs, Population of the Peoples Borned in the Year 1965 to 1970 [sic] (mimeographed), undated.

(b) Annual Reports of the Governor of American Samoa and Department of Medical Services.

Table A7. Expected Survivors of American Samoan Males, by Age: 1960-70, based on Registered Deaths and Survival Ratios of Model Life Table

Age in 1960	1960 Population	Deaths recorded(a)	Expected Survivors in 1970	Model Life Table		Expected survivors in 1970	Difference between Col(4) &(7)	1970 Census		Estimated Migration
				Level (5)	Survival Ratio (6)			Age	Population	
(1)	(2)	(3)	(4)=(2)-(3)		(6)	(7)=(2)*(6)	(8)=(4)-(7)	(9)	(10)	(11)=(7)-(10)
Births(65-70)	(2,654) (b)	87	2,567	(21)	0.95585	2,537	30	0-4	2,386	-151
Births(60-65)	(2443) (b)	126	2,317	(29) (21)	0.93497	2,284	33	5-9	2,214	-70
0-4	1,919	32	1,887	(20) (20)	0.98182	1,884	3	10-14	1,877	-7
5-9	1,689	17	1,672	(20) (20)	0.98772	1,668	4	15-19	1,602	-66
10-14	1,581	22	1,559	(20) (20)	0.98319	1,554	5	20-24	1,012	-542
15-19	1,178	23	1,153	(20) (20)	0.9778	1,152	1	25-29	864	-288
20-24	670	22	648	(19) (19)	0.96948	650	-2	30-34	776	126
25-29	484	19	465	(18) (19)	0.96218	466	-1	35-39	622	156
30-34	490	26	464	(18) (19)	0.95326	467	-3	40-44	566	99
35-39	513	34	479	(18) (19)	0.93798	481	-2	45-49	475	-6
40-44	432	42	390	(18) (18)	0.90866	392	-2	50-54	445	53
45-49	353	47	308	(18) (18)	0.87138	308	0	55-59	346	38
50-54	260	42	218	(18) (18)	0.81694	212	6	60-64	189	-23
55-59	231	54	177	(17) (17)	0.72726	168	9	65-69	162	-6
60 and over	364	184	180	(17)	0.41745	152	28	70+	146	-6
Total	10,164	777	14,484			14,375	109		13,682	-693

(a) The annual registered deaths in five-year age groups up to the year 1970 are attributed to original age chort in 1960.

(b) Estimated.

Table A8. Arrivals and Departures, American Samoa: Fiscal Years 1959-70

Fiscal Year	Total net migration	Non-West Samoans			West Samoans		
		Arrivals	Departures	Net migration	Arrivals	Departures	Net migration
1959	(86) (a)	8,326	8,240	86	u	u	u
1960	(-910) (a)	9,532	10,442	-910	u	u	u
1961	-377	9,470	10,317	-847	7,286	6,816	470
1962	1,304	13,714	13,368	346	9,511	8,553	958
1963	1,024	18,850	18,711	139	13,213	12,328	885
1964	2,247	22,333	22,060	273	16,744	14,770	1,974
1965	1,798	18,010	16,866	1,144	11,339	10,685	654
1966	3,089	16,460	15,086	1,374	10,892	9,177	1,715
1967	667	33,693	33,470	223	6,112	5,668	444
1968	1,142	38,531	37,616	915	8,470	8,243	227
1969 (b)	395	25,841	26,336	-495	6,113	5,223	890
1970	1,615	59,926	58,623	1,303	14,358	14,046	312
1961-70	12,904	256,828	252,453	4,375	104,038	95,509	8,529

(u) unavailable

(a) estimated

(b) July-December 1969 only.

Sources: Annual Reports of the Governor of American Samoa: memoranda from Immigration Devision to the Attorney General.

Table A9. Air Arrival Statistics Prepared by the Immigration Division and by the Office of Toursim, For American Samoa: January- June 1970

Month	Total air arrivlas (a)		Tourists		Business		Transients(b)	
	Immigration Division	Office of Tourism	Immigration Division	Office of Tourism	Immigration Division	Office of Tourism	Immigration Division	Office of Tourism
January	2,785	1247(c)	1,467	1,138	126	86	1,192	23
February	2,574	1,155(c)	1,215	993	179	144	1,180	18
March	2,311	1359 (d)	1,215	1,150	237	176	859	33
April	1,808	1049(e)	771	838	237	172	800	39
May	2,420	1156(f)	1,108	843	331	271	981	42
June	1,875	1,126	662	787	277	293	936	46
Total	13,773	7,092	6,438	5,749	1,387	1,142	5,948	201

(a) Excludes American and Western Samoans and Tongans.

(b) Term used by Office of Toursim is "transits."

(c) Includes two arrivals by sea (small craft).

(d) Includes one arrival by sea (small craft).

(e) Includes six arrivals by sea (small craft)

(f) Includes three arrivals by sea (small craft).

Table A10. Population Estimates by the U.S. Bureau of the Census,
For American Samoa: 1960-68

Year for which Estimations were made	Year estimations were made				
	1965 (a)	1966 (b)	1967 (c)	1968 (d)	1969 (e)
1960	20,000	20,100	20,100	20,000	
1961	19,900	20,000	20,000	19,900	
1962	21,100	21,100	21,100	21,100	
1963	23,000	21,900	21,900	21,900	
1964	22,100	21,000	23,000	23,000	
1965		21,400	24,700	25,000	
1966			27,000	27,300	
1967				28,800	28,800
1968					30,800

Source: Bureau of the Census, Current Population Reprots, P-25.
(a) No. 300, Febraury 24, 1965.
(b) No. 336, April 26, 1966.
(c) No. 358, January 18, 1967.
(d) No. 392, May 2, 1968.
(e) No. 423, May 28, 1969.

Table A11. Estimation of Population by Vital Rates Method, For American Samoa: 1960-71

Year (1)	Births(a) (2)	Estimated birth rate (b) (3)	Estimated Population (4)=(2)/(3)	Deaths(a) (4)	Estimated death rate (b) (5)	Estimated Population (6)=(4)/(5)	Final estimate of population (7)=.5[(4) + (6)]
1960	858	.042791(c)	20,051	108	.005386(c)	20,051	20,051
1961	844	0.042246	19,978	106	0.005367	19,750	19,864
1962	812	0.0417	19,472	131	0.005347	24,500	21,986
1963	975	0.041154	23,691	136	0.005328	25,526	24,608
1964	981	0.040609	24,157	111	0.005308	20,912	22,534
1965	1,072	0.040064	26,757	153	0.005289	28,928	27,842
1966	996	0.039518	25,204	150	0.00527	28,463	26,834
1967	1,015	0.038972	26,044	126	0.00525	24,000	25,022
1968	1,052	0.038427	27,376	121	0.005231	23,131	25,254
1969	1,055	0.037882	27,850	151	0.005211	28,977	28,414
1970	1,014	.037336(c)	27,159	141	0.005192	27159(c)	27,159
1971	1,042	0.03679	28,323	142	0.005173	27,450	27,886

(a) Data provided by the Department of Medical Services and Governors Annual Report, There are some discrepancies between these data andt hose released by the Territorial Registrar.

(b) A linear reduction was assumed from the observed rates of 1960 and 1970 to estimate other years.

(c) Observed rate.

Table A12. Registered Voters in 1968 and 1970 Compared with the 1970 Census Population(a) by Voting District, For American Samoa

Voting district Number	1970 census population	1968 registered voters	1970 registered voters (uncorrected)(b)	Proportion of 1968 voters to 1970 population (%)	Proportion of 1970 voters to 1970 population (%)
1	1,320	608	724	46.1	54.8
2	792	526	634	66.4	80
3	1,163	697	750	59.9	64.5
4	1,295	391	469	30.2	36.2
5	1,449	368	440	25.4	30.4
6	887	283	349	31.9	39.3
7	2,067	332	498	16.1	24.1
8	1,592	230	401	14.4	25.2
9	2,507	381	627	15.2	25
1	1,086	187	288	17.2	26.5
11	1,025	239	289	23.3	28.2
12	2,884	530	812	18.4	28.2
13	1,657	342	477	20.6	28.8
14	1,488	396	446	26.6	30
15	3,671	666	864	18.1	23.5
16	1,565	283	364	18.1	23.2
17	637	217	216	34.1	33.9
Total	27,085	6,676	8,648	24.6	31.9

(a) Excludes Swains Island.
(b) Not correct for transferred or deceased registrants or for aliens.

Table A13. Annual Estimate of Population by Broad Age Group,
For American Samoa: 1960-71

		Age Group			
Year	Under 7	7-17	18-49	50 and over	All Ages(a)
1960	5,042	6,383	6,940	1,686	20,100
1961	5,059	5,942	6,909	1,766	19,700
1962	5,018	6,305	6,750	1,902	20,000
1963	5,426	7,151	7,775	1,982	22,300
1964	5,668	7,312	8,270	1,816	23,100
1965	6,012	6,936	9,004	2,200	24,200
1966	6,072	7,715	8,889	2,530	25,200
1967	6,227	7,679	9,050	2,268	25,200
1968	6,476	7,763	9,546	2,253	26,000
1969	6,626	8,519	9,872	2,566	27,600
1970	6,607	8,264	9,814	2,474	27,200
1971	6,714	8,380	10,154	2,692	27,900

Note: For the method of estimation, see text, page 50 ff.
(a) Round to nearst 100.

Table A14. Assumed Survival Ratios Between Two Successive Five-Year Age Groups
For Projection of Male Population, American Samoa: 1970-90

	1970-75		1975-80		1980-85		1985-90	
Age	Level (a)	Ratio	Level (a)	Ratio	Level (a)	Ratio	Level (a)	Ratio
0 (b)	21	0.95585	21	0.95585	22	0.96717	22	0.96717
0-4	21	0.99139	21	0.99139	22	0.99433	22	0.99433
5-9	21	0.9957	21	0.9957	22	0.99688	22	0.99688
10-14	21	0.99467	21	0.99467	22	0.99598	22	0.99598
15-19	20	0.98981	21	0.99181	21	0.99181	22	0.99375
20-24	19	0.9853	20	0.98787	20	0.98787	21	0.99033
25-29	19	0.98395	20	0.98687	20	0.98687	21	0.98957
30-34	19	0.98093	20	0.98432	20	0.98432	21	0.98743
35-39	19	0.97531	20	0.97929	20	0.97929	21	0.98292
40-44	19	0.96583	20	0.97038	20	0.97038	21	0.97458
45-49	19	0.95075	20	0.95599	20	0.95599	21	0.9609
50-54	19	0.92774	19	0.9337	20	0.9337	20	0.9337
55-59	18	0.88634	18	0.89331	19	0.89331	19	0.89331
60 and over	17	0.68115	18	0.68701	18	0.68701	19	0.69296

(a) Mortality level of Caole-Demeny "West" Model Life Table.

(b) Survival of previous five years' births to age 0-4 (in life table notations, $\frac{5^L o)}{5^l o}$

Table A15. Assumed Survival Ratios Between Two Successive Five-Year Age Groups for Projection
of Female Population, American Samoa: 1970-90

	1970-75		1975-80		1980-85		1985-90	
Age	Level (a)	Ratio	Level (a)	Ratio	Level (a)	Ratio	Level (a)	Ratio
0 (b)	21	0.96618	21	0.96618	22	0.97546	22	0.97564
0-4	21	0.99358	21	0.99358	22	0.99605	22	0.99605
5-9	21	0.99695	21	0.99695	22	0.998	22	0.998
10-14	21	0.99647	231	0.99647	22	0.99764	22	0.99764
15-19	20	0.99254	21	0.9947	21	0.9947	22	0.99648
20-24	20	0.99053	21	0.99309	21	0.99309	22	0.99539
25-29	20	0.9888	21	0.99168	21	0.99168	22	0.99425
30-34	20	0.98649	21	0.98968	21	0.98968	22	0.99253
35-39	20	0.98294	21	0.98633	21	0.98633	22	0.9896
40-44	20	0.9771	21	0.98066	21	0.98066	22	0.98449
45-49	20	0.96755	21	0.97164	21	0.97164	22	0.97639
50-54	20	0.95294	20	0.95294	21	0.95798	21	0.95798
55-59	20	0.92919	20	0.92919	21	0.93574	21	0.93574
60 and over	20	0.7256	20	0.7256	21	0.73196	21	0.73196

(a) Mortality Level of Coale-Demeny "West" Model Life Table.
(b) Survival of previous five years' births to age 0-4 (in life table notations, $_5L_0$)
$$_5l_0$$

Table A16. Assumed Age-Specific Fertility Rates For Population Projections,
American Samoa: 1970-90

		Projections II, IV			
Age of Women	Projections I(a), III	1970-75 (b)	1975-80(c)	1980-85(c)	1985-90(c)
15-19	0.05	0.05	0.0475	0.0451	0.0428
20-24	0.2866	0.2866	0.2723	0.2586	0.2457
25-29	0.3347	0.3162	0.3004	0.2854	0.2711
30-34	0.267	0.2293	0.2178	0.2069	0.1966
35-39	0.1953	0.1953	0.1855	0.1762	0.1674
40-44	0.0878	0.0878	0.0834	0.0792	0.0753
45-49	0.015	0.015	0.0142	0.0135	0.0129

Note: Projection I assumes constant fertility and no migration; Projection II assumes declining fertility and no migration; Projection III assumes constant
 fertility and constant migration; Projection IV assumese declinding fertility and constnat migration.

(a) Average of rates for 1959-61 and 1969-70.

(b) Rates for women 25-34 years of age are taken from the observed rates
 for 1969-70. Others are the same as those of Projection I.

(c) A reduction of five percent from the previous period is assumed.

Table A17. Assumed Five-Year Migration Per 1,000
Persons, by Age and Sex, Used for Projection of
Population, American Samoa

Age group			
From	To	Males	Females
0(a)	0-4	-5	-5
0-4	5-9	-2.3	-1
5-9	10-14	-3.7	-2.6
10-14	15-19	-11.8	-10
15-19	20-24	-25	-12.5
20-24	25-29	-19.5	-11.5
25-29	30-34	-11	-10
30-34	35-39	-5.2	-8.5
35-39	40-44	-2	-6.8
40-44	45-49	-1.2	-5.2
45-49	50-54	0	-3.8
50-54	55-59	1	-2.2
55-59	60-64	1	-0.5
60 and over	65 and over	1	1

(a) Births during five years prior to enumeration.

Table A18. Population Projection I, For American Samoa: 1975-90

Age Group	Males					Females				
	1970	1975	1980	1985	1990	1970	1975	1980	1985	1990
0-4	2,386	2,934	3,686	4,634	5,542	2,791	2,791	3,506	4,398	5,261
5-9	2,214	2,365	2,909	3,665	4,607	2,290	2,290	2,773	3,492	4,381
10-14	1,877	2,204	2,355	2,900	3,653	2,194	2,194	2,283	2,767	3,485
15-19	1,602	1,867	2,193	2,346	2,888	1,889	1,889	2,186	2,278	2,761
20-24	1,012	1,586	1,852	2,175	2,331	1,475	1,475	1,879	2,175	2,270
25-29	864	997	1,566	1,829	2,154	1,147	1,147	1,465	1,866	2,165
30-34	776	850	984	1,546	1,810	807	807	1,137	1,452	1,856
35-39	622	761	837	969	1,526	740	740	798	1,126	1,442
40-44	566	607	745	819	952	611	611	730	788	1,114
45-49	475	547	589	723	799	584	584	600	716	775
50-54	445	452	523	563	695	444	444	568	582	699
55-59	346	413	419	488	525	357	357	423	544	558
60-64	189	307	366	374	436	259	259	332	396	509
65 and over	308	338	443	556	644	386	386	468	586	718
Total	13,682	16,228	19,467	23,587	28,562	15,974	15,974	19,148	23,166	27,994

Note: Projection I assumes constant fertility and no migration.

Table A19. Population Projection II, For American Samoa: 1975-90

Age Group	Males					Females				
	1970	1975	1980	1985	1990	1970	1975	1980	1985	1990
0-4	2,386	2,817	3,359	4,002	4,532	2,305	2,680	3,195	3,799	4,302
5-9	2,214	2,365	2,793	3,340	3,979	2,201	2,290	2,663	3,182	3,784
10-14	1,877	2,204	2,355	2,784	3,329	1,896	2,194	2,283	2,658	3,176
15-19	1,602	1,867	2,193	2,346	2,773	1,486	1,889	2,186	2,278	2,651
20-24	1,012	1,586	1,852	2,175	2,331	1,158	1,475	1,879	2,175	2,270
25-29	864	997	1,566	1,829	2,154	816	1,147	1,465	1,866	2,165
30-34	776	850	984	1,546	1,810	750	807	1,137	1,452	1,856
35-39	622	761	837	969	1,526	622	740	798	1,126	1,442
40-44	566	607	745	819	952	598	611	730	788	1,114
45-49	475	547	589	723	799	459	584	600	716	775
50-54	445	452	523	563	695	375	444	568	582	699
55-59	346	413	419	488	525	279	357	423	544	558
60-64	189	307	366	374	436	172	259	332	396	509
65 and over	308	338	443	556	644	360	386	468	586	718
Total	13,682	16,111	19,024	22,514	26,485	13,477	15,863	18,727	22,148	26,019

Note: Projection II assumes declining fertility and no migration

Table A20. Population Projectiong III, For American Samoa: 1975-90

Age Group	Males					Females				
	1970	1975	1980	1985	1990	1970	1975	1980	1985	1990
0-4	2,386	2,644	2,965	3,389	3,775	2,305	2,514	2,820	3,217	3,584
5-9	2,214	2,311	2,561	2,880	3,292	2,201	2,267	2,473	2,781	3,172
10-14	1,877	2,123	2,215	2,458	2,765	1,896	2,137	2,201	2,404	2,704
15-19	1,602	1,647	1,863	1,946	2,159	1,486	1,700	1,916	1,976	2,159
20-24	1,012	1,190	1,225	1,386	1,451	1,158	1,290	1,480	1,667	1,723
25-29	864	803	946	974	1,105	816	1,015	1,134	1,301	1,468
30-34	776	757	706	831	858	750	726	905	1,012	1,164
35-39	622	722	707	659	778	622	677	657	819	919
40-44	566	595	693	679	635	598	570	622	604	755
45-49	475	540	570	665	654	459	554	530	578	564
50-54	445	452	516	545	639	375	428	518	496	543
55-59	346	416	423	486	514	279	350	399	486	465
60-64	189	309	372	381	439	172	258	323	371	453
65 and over	308	342	451	571	667	360	390	474	589	710
Total	13,682	14,851	16,213	17,850	19,731	13,477	14,876	16,452	18,301	20,383

Note: Projection III assumes constant fertility and constant migration.

Table A21. Population Projection IV, For American Samoa: 1975-90

Age Group	Males					Females				
	1970	1975	1980	1985	1990	1970	1975	1980	1985	1990
0-4	2,386	2,538	2,703	2,930	3,095	2,305	2,414	2,571	2,782	2,938
5-9	2,214	2,311	2,459	2,626	2,847	2,201	2,267	2,375	2,535	2,743
10-14	1,877	2,123	2,215	2,361	2,521	1,896	2,137	2,201	2,308	2,464
15-19	1,602	1,647	1,863	1,946	2,075	1,486	1,700	1,916	1,976	2,072
20-24	1,012	1,190	1,225	1,386	1,451	1,158	1,290	1,480	1,667	1,723
25-29	864	803	946	974	1,105	816	1,015	1,134	1,301	1,468
30-34	776	757	706	831	858	750	726	905	1,012	1,164
35-39	622	722	707	659	778	622	677	657	819	919
40-44	566	595	693	679	635	598	570	622	604	755
45-49	475	540	570	665	654	459	554	530	578	564
50-54	445	452	516	545	639	375	428	518	496	543
55-59	346	416	423	486	514	279	350	399	486	465
60-64	189	309	372	381	439	172	258	323	371	453
65 and over	308	342	451	571	667	360	390	474	589	710
Total	13,682	14,745	15,849	17,040	18,278	13,477	14,776	16,105	17,524	18,981

Note: Projection IV assumes declining fertility and constant migration

APPENDIX B
Figures

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Figures are in PDF form

APPENDIX C

Illustration of Population Estimation Procedure by a modified composite method, For American Samoa: 1971

A. Estimation of Population under seven years of age
    A.1 Estimating from birth data
        (a) Total registered births, five years preceding (half of 1966 and 1971 births plus all births of 1967, 1968, 1969, and 1970)………………5,155
        (b) Under-registration ratio……………………………………1.000
        (c) Estimated total births, five years preceding (a) ÷ (b)…………5,155
        (d) Survival ratio to age group 0-4 years………………………... .91230
        (e) Estimated population 0-4 years, 1971 (c) x (d)………………4,703
        (f) Conversion ratio to population 0-6 years…………………… .70749
        (g) Estimated population 0-6 years, 1971 (e) ÷ (f) ………………6,647
    A.2 Estimating from the population of childbearing age
        (a) Estimated population 18-49, 1971 Copy from C.3 ………. 10,154
        (b) Conversion ratio to population 0-6 years ……………….. .66789
        (c) Estimated population 0-6 years, 1971 (a) x (b)………….. 6,782
    A.3 Final Estimate
        Average of A.1 (g) and A.2 (c) ……………………………. 6,714

Remark

    A.1 (b) Birth registration is considered to be 100 percent from 1965.

    A.2 (d) This is a ratio interpolated from 1960 and 1970 data. In 1960 in an estimate of 4,277 five-year births 1955-60 there were 3,709 children under age give. In 1970 for 5,161 births of preceding five-year, there were 4,691 children. Thus, the survival ratios from five-year births to age group 0-4 become .86720 in 1960 and .90893 in 1970. This ratio is determined by the death rate in the age group and by migration. It is assumed that the "depletion ratio"—i.e., the complement of the survival ratio—takes a constant reduction rate; that is, it takes a form of e^{-rt}, where e is the base of natural logarithm, r is the reduction rate, and t is the time in years. From the depletion ratios of 1960 and 1970, r= .037722 was estimated. For other years, measuring t from 1960, estimates of depletion ratios would be obtained. For instance, for 1971, $e^{(-.30772)(11)}$ = .08770. Taking the complement from an estimated depletion ratio, the survival ratio was obtained. The following table provides the survival ratio by year:

Year	Survival Ratio
1960	.86720
1961	.87212
1962	.87685
1963	.88141
1964	.88580
1965	.89003
1966	.89410
1967	.89802
1968	.90179
1969	.90543

Year	Survival Ratio
1970	.90893
1971	.91230
1972	.91555
1973	.91868
1974	.92169
1975	.92458
1976	.92738
1977	.93006
1978	.93265
1979	.93515

A.1 (f) On the assumption that the ratio of population 0-4 years to that 0-6 years would be stabilized some day, again a negative exponential function e^{-rt} was fitted to observed ratios of 1960 and 1970. The actual values by year are:

Year	Conversion Ratio
1960	.73562
1961	.73302
1962	.73042
1963	.72784
1964	.72526
1965	.72270
1966	.72014
1967	.71759
1968	.71506
1969	.71252
1970	.71000
1971	.70749
1972	.70499
1973	.70250
1974	.70001
1975	.69754
1976	.69507
1977	.69261
1978	.69016
1979	.68772

A.2 (b) Anticipating a decline of fertility, we assumed a constant reduction in the ratio. The observed ratios was .72651 in 1960 and .67322 in 1970. One-tenth of the difference—i.e., .005329—was applied as the annual decrement for other years.

B. Estimation of population 7-17 years of age
   (a) Number of elementary school children enrolled for 1971, grade 1-8…………………………………….. 7,294
   (b) Enrollment ratio………………………………………………… .87040
   (c) Estimated population 7-17, 1971 (a) ÷ (b) ………………. 8,380

Remark
　　　Since there was discontinuity in the school statistics between 1965 and 1966, it was decided to apply a constant enrollment ratio prior to 1966 and another after that time. From the GAS enrollment figures for 1960 and 1970 and from the census population of 7-17 years of age, the earlier ratio was determined to be .71910 and the later one .87040. It is realized that a further refinement of the ratio is necessary.

C. Estimation of population 18-49 years of age
　　C.1 Estimating from birth of the current year
　　　　(a) Number of births registered in 1971……………………………… 1,042
　　　　(b) Under-registration factor………………………………………….. 1.000
　　　　(c) Estimated births in 1971 ……………………………………….. 1,042
　　　　(d) Estimated general fertility rate……………………………..…… .20098
　　　　(e) Estimated female population 18-49 years, 1971
　　　　　　(c) ÷ (d)………………………………………………………….. 5,184
　　　　(f) Conversion ratio applied to the total population……………. .50184
　　　　(g) Estimated total population 18-49 years, 171
　　　　　　(e) ÷ (f)…………………………………………………………….. 10,331

　　C.2 Estimating from two-year birth rate data
　　　　(a) Number of registered births in 1970 and 1971……………. 2,056
　　　　(b) Under-registration factor ………………………………………. 1.000
　　　　(c) Estimated births in 1970 and 1971………………………….. 2,056
　　　　(d) Estimated fertility ratio………………………………………….. .41067
　　　　(e) Estimated female population 18-49, 1971
　　　　　　(c) ÷ (d) ……………………………………………………….. 5,006
　　　　(f) Conversion ratio applied to the total population…………….. .50184
　　　　(g) Estimated total population 18-49, 1971
　　　　　　(e)÷ (f) …………………………………………………………… 9,976

　　C.3 Final estimate: average of C.1 (g) and C.2 (g)……………… 10,154

Remark
　　　C.1 (d) The observed ratios were .24628 fro 1960 and .20510 for 1970. Assuming a constant reduction for the time being, we applied an annual decrement of .004118 for other years.
　　　C.1 (f) The observed ratios were .52305 for 1960 and .50377 for 1970. Assuming a constant reduction for the time being, we applied an annual decrement of .001928 for other years.
　　　C.2 (d) As in C.1 (d) an annual decrement .00782 was applied for the observed ratios of .49669 in 1960 and .41489 in 1970.
　　　C.2 (f) See the remark for C.1 (f)
D. Estimation of population 50 years and over
　　D.1 Estimating from the series of constant increase assumption
　　　　(a) The census population aged 50 and over in 1970…………. 2,474
　　　　(b) Annual increment……………………………………………….78.8

(c) Estimated population aged 50 and over 1971
   (a) + 1 x (b)………………………………………….. 2,553

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